Taking Shots: The Modern Miracle of Vaccines

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"Getting a shot." For most of us, these 3 words conjure some of the most vivid recollections of the modern childhood experience. When I hear this phrase, I am immediately transported, in my mind's eye, to the early 1960s. I am dressed in my newest clothes and driven to Dr. Kovan's office in a distant suburb of Detroit. Apparently, Dr. Kovan was well worth the drive. He was "the best pediatrician in the city," according to the popular perceptions of the 20-something-year old-moms that populated my hometown of Oak Park, Michigan.

At each visit, the avuncular and medically gifted Dr. Kovan poked, prodded, and nosed about in search of some abnormality until our clinical tête-à-tête was clearly over. At this point, he'd invariably say, "Go down the hall to see if Mary the nurse might fix you up with a lollipop."

"Fix you up with a lollipop". Right. Going down the hall to see Mary meant only one thing. Shots. I cannot honestly say that my vaccinations at the age of 4 or 5 inspired me to become a pediatrician, but I did learn one valuable thing from Dr. Kovan that remains a constant in my practice: Always have a nurse [or a medical assistant] give the shots. Such pointed assaults -- no matter how beneficial the stuff you're injecting -- often wreak havoc on the doctor-patient relationship when a child realizes that the same person who is examining her is about to stab her with a sharp needle.

Mary always wore a starched, white uniform and the peaked nurse's cap of an RN, confidently astride her iron-gray hair. She also knew a heck of a lot about general pediatrics. So even if you could not get through to the great Kovan because the question was too mundane for the almost Talmudic proportion of clinical demands he faced on a daily basis, you were assured of sound medical advice from Mary. But she also was a swift, relentlessly aggressive vaccinator. Squirm, beg, plead, run -- you were not going to outdistance this innoculative missionary. Ultimately, she gained incontrovertible hold of your upper forearm, swabbed it with rubbing alcohol, and before the volatile agent ever had a chance to dry, jabbed the hypodermic needle and plunged out its contents into a soon-to-be throbbing deltoid muscle. It was only after this painful exercise that you had a chance at grabbing the proffered lollipop.

As a pediatrician for almost 20 years, I know that everyone who reads these words is recollecting his or her own encounter with the needle and can reel off a detailed and vivid account of those vaccinations. It is entirely fitting that every single child and adult born after, at least, 1920, recalls this pivotal event in his or her life as a patient. Indeed, if you challenged a medical historian to come up with a top-10 list of the greatest achievements of modern medicine, you would be hard-pressed not to rank vaccination as number 1 through 5.

Literally, millions of lives have been saved because so many deadly, constantly stalking microbes are stopped in their tracks before they can ever strike. And, in essence, the

vaccine represents the single, greatest direction of medicine: the prevention of disease before it ever has a chance to occur.

Few of us today give much thought to the gasping breath of the whooping cough, let alone the iron lungs and braces of children attacked by polio, or the devastating birth defects caused by the "German measles" virus. For most Americans, these once-feared and common scourges are relics of an ancient history. Yet only a little more than 100 years ago, the infant mortality rate in the United States was an astounding 20%. In other words, for every 5 babies born, 1 would die before his first birthday, and almost always the cause was infectious in origin. But as any doctor will tell you, the primary reason that childhood killers ranging from diphtheria to measles have been tamed in recent years is the widespread, safe, effective, and affordable vaccination of American children.

One of my favorite concepts picked up during a medical school immunology class was that of herd immunity. Basically, if enough people in a given community are immunized against a particular contagious disease, it is difficult for the germ that causes the disease to be communicated among those who are not immunized against it. Epidemiologists shoot for an 85% to 90% immunization rate to assure herd immunity, although this figure can be affected by environmental factors, the strength of each individual's immune system, and how rapidly infectious the disease is. It is precisely because of the concept of herd immunity that we pediatricians are such sticklers for making sure every child is vaccinated.

Many pediatricians in practice today report that parents frequently express fears about vaccines, especially surrounding their safety. Worse, more and more parents are refusing to allow their children to be immunized. But there's even more frightening news: it was only a few years ago that some portions of the United States reported some of the lowest childhood immunization rates in more than 50 years.

Although several individual states have made elaborate and successful public health plans to improve those rates, we are experiencing new threats to our nation's immunity safety net: budget cuts for vaccination efforts of all children, shortages of vaccines, and rising fears that some vaccines may be unsafe. An example of a recent concern is that over a putative connection of a vaccine preservative called thimerosal to the rise of autism. Indeed, even after last month's release of the definitive Institute of Medicine study disproving any potential relationship between the mercury-based preservative and autism, several members of Congress, led by Rep. Dan Burton (R-IN) (who does not have any specific training in epidemiology, virology, or medicine), denounced the report as erroneous, helping to fuel the fire of parental fears over these life-saving products.

But the recent vaccine scares related to thimerosal, which has been used as a preservative in many vaccines made from the 1930s up to the recent past, are only the latest wrinkle in a movement that has been going on since Dr. Edward Jenner first introduced the smallpox vaccine. One of my favorite examples of the often-vigorous opposition to vaccines occurred in a German immigrant neighborhood in Milwaukee during 1894. After the public health department issued an edict requiring all school children to be vaccinated against smallpox and those discovered to be infected with the microbe isolated in a quarantine hospital, more than 3000 angry people, armed with

clubs, knives, and stones, organized a violent riot. In the midst of a very real smallpox epidemic that summer, the thousands of people roaming the streets or protecting those houses with smallpox victims in them actually presented a real threat to the city's health.

Such public demonstrations were hardly uncommon during the late19th and early 20th centuries, but they reached a climax in the early 1900s when several anti-vaccinationists challenged compulsory vaccinations all the way to the US Supreme Court. In 1905, the highest court in the land declared that public health doctors did indeed have the right and responsibility to vaccinate children when they deemed the shots both safe and necessary.

Sometimes, of course, there have been good reasons to fear the side effects of vaccines. They are, after all, biological products that contain either killed microbes or "attenuated live" germs, and there is always a potential for dangerous complications even though such events are exquisitely rare. For example, during the viral attenuation process, a strain of a particular germ is bred and weakened through successive generations so that it no longer causes a particular disease but can still fool the immune system into creating germ-specific antibodies against it. In both types of vaccines, however, killed and live attenuated, it is entirely possible that a particular batch of vaccine can become contaminated with living, pathogenic germs or the attenuation process can go awry. Hence, the shot may actually cause the disease in question rather than preventing it.

Thankfully, quality-control measures have been developed over the past century to ensure that this rarely occurs and, of course, if it does, we have mechanisms in place that allow doctors to act swiftly and correct such problems. Most important, we need to teach parents that the risk of being harmed by vaccines is infinitesimally small, and the benefits realized by the millions who receive them far outweigh this risk. Parents must also be made aware of their children's very real risk of contracting a deadly infection when they are not immunized.

Throughout history, miracles -- both the spiritual kind and those that are more scientific in nature -- have always had their detractors. But the miracle of life-saving, disease-preventing vaccines is simply too important to become mired in fallacious arguments, fear, or politics. And we as pediatricians and pediatric healthcare professionals need to be on the front line, discussing, instructing, and helping our patients and their parents to be fully immunized against all childhood infections.

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